

Technical University of Denmark



Investigation of Conductivity and Ambipolar Transport of Hydrogen in Ni Doped SrCe_{1-x}YxO_{3-delta}

Bentzer, Henrik Karnøe; Bonanos, Nikolaos; Phair, John

Published in:
Meeting Abstracts - Electrochemical Society

Publication date:
2010

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Bentzer, H. K., Bonanos, N., & Phair, J. (2010). Investigation of Conductivity and Ambipolar Transport of Hydrogen in Ni Doped SrCe_{1-x}YxO_{3-delta}. In Meeting Abstracts - Electrochemical Society (pp. Abstract 684). Electrochemical Society, Incorporated.

DTU Library
Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Investigation of conductivity and ambipolar transport of hydrogen in Ni doped $\text{SrCe}_{1-x}\text{Y}_x\text{O}_{3-\delta}$

Henrik K. Bentzer, Nikolaos Bonanos and John W. Phair
Division for Fuel Cells and Solid State Chemistry, Risø
National Laboratory for Sustainable Energy, Technical
University of Denmark
PO Box 49, DK-4000, Roskilde, Denmark

In recent years, developments in high temperature proton conductors have seen the introduction of transition metals into known proton conducting materials. These metals have been introduced both as dopants and additional phases in different studies.

Studies have shown that even small amounts of transition metal dopants are able to greatly change the overall conductivity. The nature of this change depends greatly on both the parent system and the choice of transition metal dopant, as well as microstructural effects. Both lower [1,2] and higher [3-5] conductivities have been reported, and similarly, both increased [e.g. 3] and unchanged or decreased sinterability [e.g. 1-2].

For use as electrolytes in fuel cells, pure ionic conductivity is vital and increased electronic conductivity would significantly reduce a materials potential in this field. For hydrogen separation membranes however, the situation is different, as protonic and electronic conductivities should both be high, preferably making up roughly half of the total conductivity each.

Therefore, we investigated the effect of introducing nickel as a B-site dopant into the well known proton conductor $\text{SrCe}_{1-x}\text{Y}_x\text{O}_{3-\delta}$. The total conductivity, in a series of samples with varying Ni-content, was measured using impedance spectroscopy as a function of both temperature and p_{O_2} . Structural and microstructural features were investigated using powder x-ray diffractometry and scanning electron microscopy.

The applicability of the materials in hydrogen membranes was evaluated using electromotive force and hydrogen flux measurements. The measurements were compared to calculations based on defect chemical models of the materials.

[1] T. Shimura, H. Tanaka, H. Matsumoto and T. Yogo, *Solid State Ionics*, 176 (2005), 2945

[2] S.B.C. Duval, P. Holtappels, U. Stimming and T. Graule, *Solid State Ionics*, 179 (2008), 1112

[3] S. Tao, J.T.S. Irvine, *Journal of Solid State Chemistry*, 180 (2007), 3493

[4] E. Gorbova, V. Maragou, D. Medvedev, A. Demin and P. Tsiakaras, *Journal of Power Sources*, 181 (2008), 292

[5] R. Costa, N. Grünbaum, M.-H. Berger, L. Dessemond and A. Thorel, *Solid State Ionics*, 180 (2009), 891